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REVIEWS

Marine Algae of the Monterey Peninsula. By Gilbert M. Smith. Stanford University Press. vii + 622 pages, 98 plates. 1944. $6.00.

The appearance of a flora in a field in which there are less than half a dozen modern treatises is an event of first importance. Professor Smith has filled one of the outstanding gaps in our knowledge of marine phycology. Since the Monterey flora includes 80 per cent of the known seaweeds of the Pacific Coast of the United States, the importance of the book is much greater than the title suggests. Furthermore this locality is of especial historic interest as the type locality of approximately a quarter of the species described from this coast.

That the northeastern Pacific possesses a rich, varied and in some ways unique seaweed flora has been known for a long time. Setchell and Gardner have given excellent accounts of the Cyano-

phyceae, Chlorophyceae and Phaeophyceae but they did not live to complete their work on the red algae. Therefore the present section on the Rhodophyceae as the first comprehensive account, represents a most notable and definite contribution to organized algological knowledge, especially since the red algae constitute between 40 and 50 per cent of the total number of species of green, brown, and red algae occurring along the west coast of the United States.

In the introduction a brief historical sketch is given of seaweed collecting in the Monterey area, from the time of Menzies' visit during 1792–93 up to the death of Gardner in 1937. The annotated list of old and new place names will prove invaluable to future collectors in view of the fact that in a given region so many species appear year after year only along a certain stretch of shore or even on a particular rock. Other topics which are briefly discussed in the introduction include the Monterey and Pacific Coast distribution of algae in relation to ecologic factors, and instructions in seaweed collecting.

In a field which has become as technical as phycology, the adoption of a uniform terminology goes far toward a simplification of the subject matter. The skill with which this has been accomplished would be hard to improve upon. In pursuit of such uniformity the author has, however, borrowed a few terms whose adoption for the algae is open to criticism. Thus for example he has followed Pascher in using the terminal component *-phyta* in the place of *-phyceae* in the divisional names of the algae. Terminations derived from φῦκος not only have a precise meaning but are so old and well established in algological literature that their suppression in favor of the less precise *-phyta* is to be regretted. We thus have Chlorophyta (green plants), Phaeophyta (brown plants), Rhodophyta (red plants), instead of Chlorophyceae (green algae), Phaeophyceae (brown algae), and Rhodophyceae (red algae). If by adopting Pascher's terms we had arrived at a uniform terminal component for all divisions of plants, this might justify the *-phyta* ending. This is not achieved, however, since the fungi, gymnosperms and angiosperms were designated by Professor Smith at least as recently as 1938 as Eumycetae, Gymnospermae and Angiospermae, respectively. The divisional names in *-phyta* moreover lead to certain unnecessary inconsistencies in systematic arrangement. Thus the author recognizes a single class (Chlorophyceae) in the marine green algae, three classes (Isogeneratae, Heterogeneratae and Cyclosporeae) in the brown algae and one class (Rhodophyceae) with two subclasses (Bangioideae and Florideae) in the red algae. If one is to accept a class Chlorophyceae in the green algae and a class Rhodophyceae in the red algae, there would be equal justification for a single class Phaeophyceae in the brown algae. It would be futile to attempt to correlate the different categories of the various divisions of

algae. Nevertheless there is little ground for believing that the differences between the Bangioideae and Florideae in the Rhodophyceae are of lesser magnitude than those between the Isogeneratae, Heterogeneratae and Cyclosporeae in the Phaeophyceae, or that the three latter deserve the rank of class while the two former remain subclasses.

Similarly, little is to be gained by substituting Blakeslee's terms homothallic and heterothallic for the old and generally used terms monoecious and dioecious. Even isogamous algae usually show a physiological anisogamy and the male and female thalli can be separated on the basis of the different behavior of their gametes.

Probably in no other group of plants are details of the life history so intimately linked with classification as in the algae. Hence it does not seem out of place to consider briefly two instances of morphological interpretation in the brown algae to which the reviewer takes exception.

Owing to the extremely doubtful results of a few investigators in regard to the behavior of the zoids from the pleurilocular organs of *Ilea, Colpomenia* and *Scytosiphon* the author takes a noncommittal stand with reference to the nature of the macroscopic thalli in these genera. There seems to be little reason, however, for questioning their asexual or sporophytic character. If the plants were gametophytes and the zoids from the plurilocular organs gametes, it is to be expected that a generation forming unilocular sporangia, the seat of the reduction division in this group of brown algae, would be formed at some phase in the life cycle. Although these genera are found in many parts of the world and have been studied extensively both from field collections and in culture, they have never, as far as the reviewer is aware, been known to form unilocular sporangia. The evidence is overwhelmingly in favor of the conclusion that the thalli represent the sporophytic generation, that sexuality has been lost entirely in these genera, and that the plants reproduce themselves only by zoöspores from plurilocular sporangia.

The author refers to the eggs and sperms of the Fucales as macrospores and microspores, respectively. Although the evolutionary origin of the reproductive organs of the Fucales is still unknown, there is little justification for considering the eggs and sperms as the equivalent of spores. In the female sex organs meiosis is always followed by one series of mitotic divisions, resulting in the formation of eight haploid nuclei, while in the male organs meiosis is followed by four or five series of divisions, resulting in the formation of 64 or 128 nuclei. The contents of the mature reproductive organ may thus be looked upon, in the opinion of Strasburger, as a reduced gametophyte of which all the functional nuclei have become separated as gametes. According to this interpretation, which apparently is the one accepted by

the author, the four nuclei formed in consequence of meiosis would be the only equivalent of spores in the Fucales.

In the systematic arrangement and in the descriptions, the author has taken account of the many recent advances in our knowledge of the structure and reproduction of the algae. The green algae are classified according to the system previously published by the author while in the brown and red algae the systems of Kylin are adopted. The same general plan is followed with respect to the treatment of the three major groups. In each case the divisions are characterized and keys and descriptions are given to the classes, orders, families, genera and species. The authors and dates of publication of the genera are given as well as the more important references on their structure and reproduction. For the species, in addition to the description, the Monterey and Pacific Coast distributions are given, and where necessary remarks on the biology or other matters of a critical nature. The citations of literature for the species include those to the more important synonyms, the original description, and the combining author of the combination in the case of a transfer. The type locality is given separately.

The volume embraces 177 genera and 392 species and varieties. Several species are reported for the first time from this coast and the following are newly described: *Ralfsia pacifica* Hollenberg, *Desmarestia linearis* Gardner, *Porphyra Thuretii* Setchell and Dawson and *Herposiphonia pygmaea* Hollenberg. Several new combinations are made in the genera *Acrochaetium* and *Fosliella*. The combination *Acrochaetium Macounii* had, however, been made previously by Hamel (Rev. Alg. 3: 184. 1928).

In his treatment of *Acrochaetium* and *Rhodochorton* the author departs from the generally accepted concept of the limits of these genera. He places in *Acrochaetium* all the species of this complex which form only monosporangia as asexual reproductive organs and in *Rhodochorton* all those bearing tetrasporangia, irrespective of the fact that they may also form monosporangia, as is the case in *Rhodochorton* (*Acrochaetium*) *Daviesii*, and irrespective of the type of chromatophore. Other modern writers who recognize the two genera as distinct refer to *Acrochaetium* all species in which the cells contain from one to a few chromatophores, whether they be stellate, plate-like or band-shaped, and to *Rhodochorton* those species in which the cells contain from a few to many chromatophores. Accordingly *Rhodochorton* never includes species forming monosporangia. The limits between *Acrochaetium* and *Rhodochorton* admittedly are not sharp and a few workers have consequently accepted the conclusions of Drew, who maintains that the two genera should be united under the name *Rhodochorton*. In general, however, the two genera are readily separable on the basis of the type of chromatophore. According to the arrangement of the author there would be ample justification for uniting

them, since *Rhodochorton* would not only be composed of a heterogeneous assortment of species but would even include the type species of *Acrochaetium,* namely, *A. Daviesii.*

In accordance with accepted custom, the author recognizes a family Chantransiaceae, in which he places *Acrochaetium* and *Rhodochorton.* Since the genus *Chantransia* of De Candolle did not include a single species of *Acrochaetium* or of *Rhodochorton,* the family name Chantransiaceae is in contravention of Article 23 of the International Code (1935). The name was recently changed to Acrochaetiaceae by Fritsch (Bot. Rev. 10: 258, note. 1944).

The order Gelidiales is characterized as having cruciately or zonately divided tetrasporangia. However, as now recognized this order includes only genera with cruciately divided sporangia.

The family Nemastomaceae is characterized as having zonately divided tetrasporangia but when Kylin established the family he characterized it as having, as far as known, cruciately divided sporangia, which is true at least of two of the three genera, namely, *Nemastoma* and *Platoma.* Until recently sporangia were not known in the remaining genus, *Schizymenia.* In 1943 Smith and Hollenberg transferred to *Schizymenia* the *Peyssonneliopsis epiphytica* of Setchell and Lawson as well as its so-called host, which Smith and Hollenberg believed to be stages of one and the same plant. This species forms zonately divided tetrasporangia in nemathecia. In the present volume, tetrasporangia are reported for the first time in *Schizymenia pacifica* but no specific statement is made as to their method of division. The sporangia are, however, said to be remote from one another, which is also the condition in *Nemastoma* and *Platoma.* Sporangia are still unknown in the type species of *Schizymenia, S. Dubyi,* but their localization in nemathecia in *S. epiphytica* is a condition which is foreign to *Nemastoma* and *Platoma* as well as to *S. pacifica,* which has heretofore been considered a good species of *Schizymenia.* It would seem therefore that the condition in regard to the sporangia of *S. epiphytica* is sufficiently distinct from that in the other members of the Nemastomaceae to justify its exclusion from both *Schizymenia* and the Nemastomaceae.

A genus of particular interest is *Goniotrichopsis,* which was described by the author in 1943. This genus is closely related to *Goniotrichum* but differs from it and all other marine Bangioideae, as far as the reviewer is aware, in one significant feature, namely, the presence in each cell of several disc-shaped chromatophores. This is a condition which should be sought for in other members of the Bangioideae.

Tetrasporangia are reported in *Opuntiella.* This is an important discovery inasmuch as sporangia had thus far not been recorded for this genus.

The comprehensive keys to the genera have passed through

four revisions in the course of Professor Smith's seventeen years' study and teaching at the Hopkins Marine Station. The rigorous tests which they have consequently undergone coupled with the fact that they are based almost exclusively on vegetative characters are good guarantees of their great value.

The illustrations, many of which were prepared by Mrs. Carl F. Janish, rank amongst the best that have been given of the algae. Approximately 80 per cent of the species are illustrated, many of them for the first time. The drawings show the general appearance of the plant but details of structure are also figured if necessary in the identification of genera or species.

Students of marine algae throughout the world will welcome this volume. The work may well serve as a guide in the preparation of future marine floras.—George F. Papenfuss, Department of Botany, University of California, Berkeley.

Illustrated Flora of the Pacific States. Volume two. *Buckwheats to Kramerias.* By LeRoy Abrams. Pp. viii + 635, with 1663 figs. Stanford University Press. 1944. $7.50.

Volume two of this important work embraces those families from Polygonaceae through Krameriaceae. As in volume one the species, with very few exceptions, are illustrated, but unlike the preceding volume the illustrations are aggregated on separate pages, thus reducing costs and greatly enhancing the appearance of the format. The quality of the illustrations is much improved and greater attention has been paid to the depiction of significant details.

The treatment of families follows the author's established policy of segregation; thus we find instead of the single family, Leguminosae, the families Caesalpinaceae, Mimosaceae and Fabaceae. The Rosaceae and Saxifragaceae of other California authors receives similar treatment, a point of view that can be easily and logically defended. Certain inconsistencies in this policy stand out with respect to some of the smaller families. Aizoaceae includes two somewhat discordant elements, the Molluginaceae having hypogynous flowers and a curved embryo much like that found in the Caryophyllaceae, and the Ficoidaceae with its epigynous or perigynous flowers and an embryo that in most cases is bent much like that in many Cactaceae. Cabombaceae with its ranalian type of flower is included with the Nymphaceae, a group having many features allying it with the Rhoedales. These are minor problems and the urge to split these families certainly does not have behind it the impelling force of "facility in handling" that one finds in such large families as Leguminosae and Rosaceae.

A similar policy is adhered to in the treatment of genera, for example, it seems good judgment to separate *Grossularia* from *Ribes* and *Fendlerella* from *Whipplea.* The number of "problem